USING COST UNCERTAINTY AS A SOURCE OF RISK MITIGATION FUNDING

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AGENDA

- Purpose
- Background
- Methodology
- Sample Products
- Results Summary
- Intentions
- Summary of Key Points
- Questions/Concerns/Issues

PURPOSE

To share an approach that uses the uncertainties related to cost estimating as a source of funding for an acquisition program's risk mitigation efforts.

BACKGROUND

Overview of MARCORSYSCOM

- Mission
- Locations
- Scope of Programs
- Relationship to Others in the USMC Acquisition Team

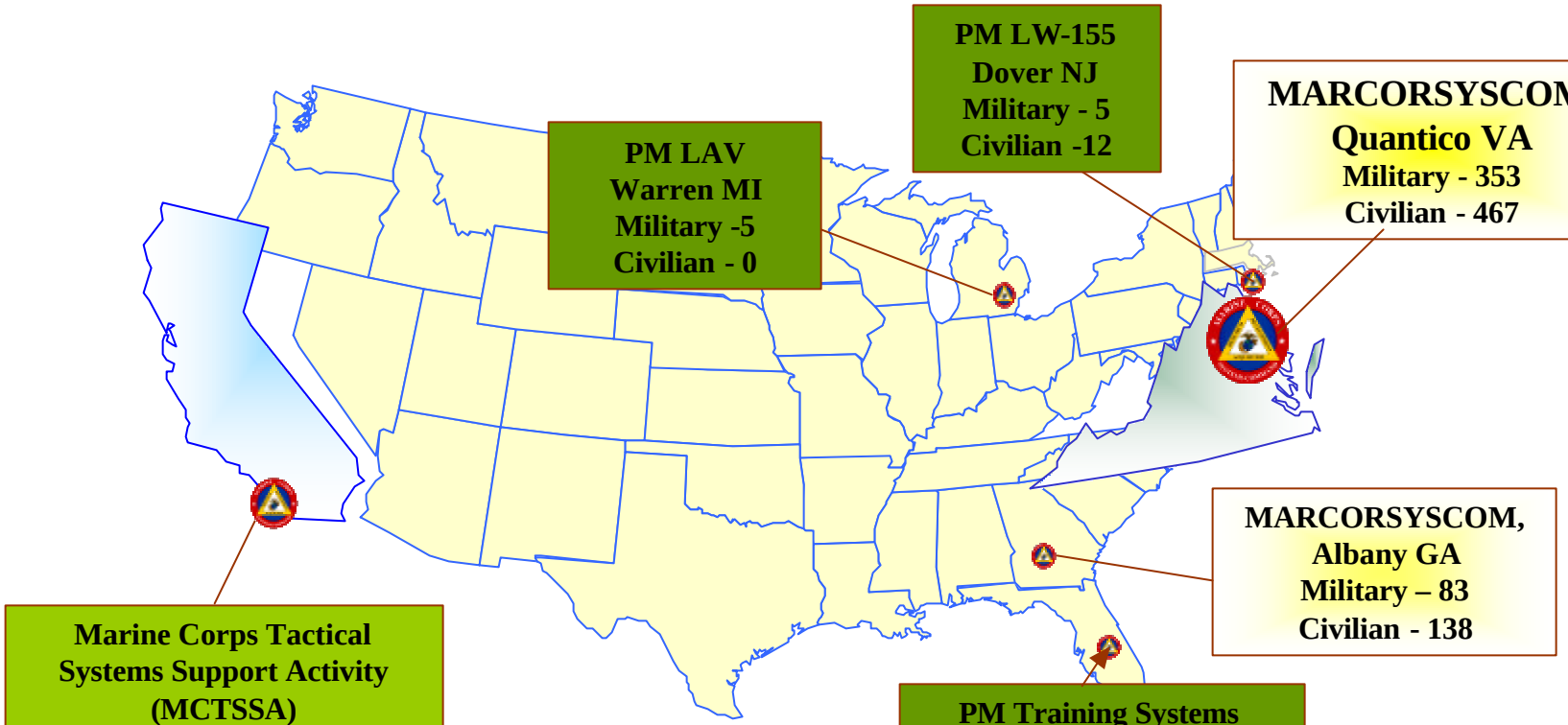
BACKGROUND

Mission

To serve as the Commandant's principal agent for equipping the Operating Forces to accomplish their warfighting mission

BACKGROUND

Command Locations
Principal Activities - Workforce



Command Workforce: 1524 - 695 Military / 829 Civilian

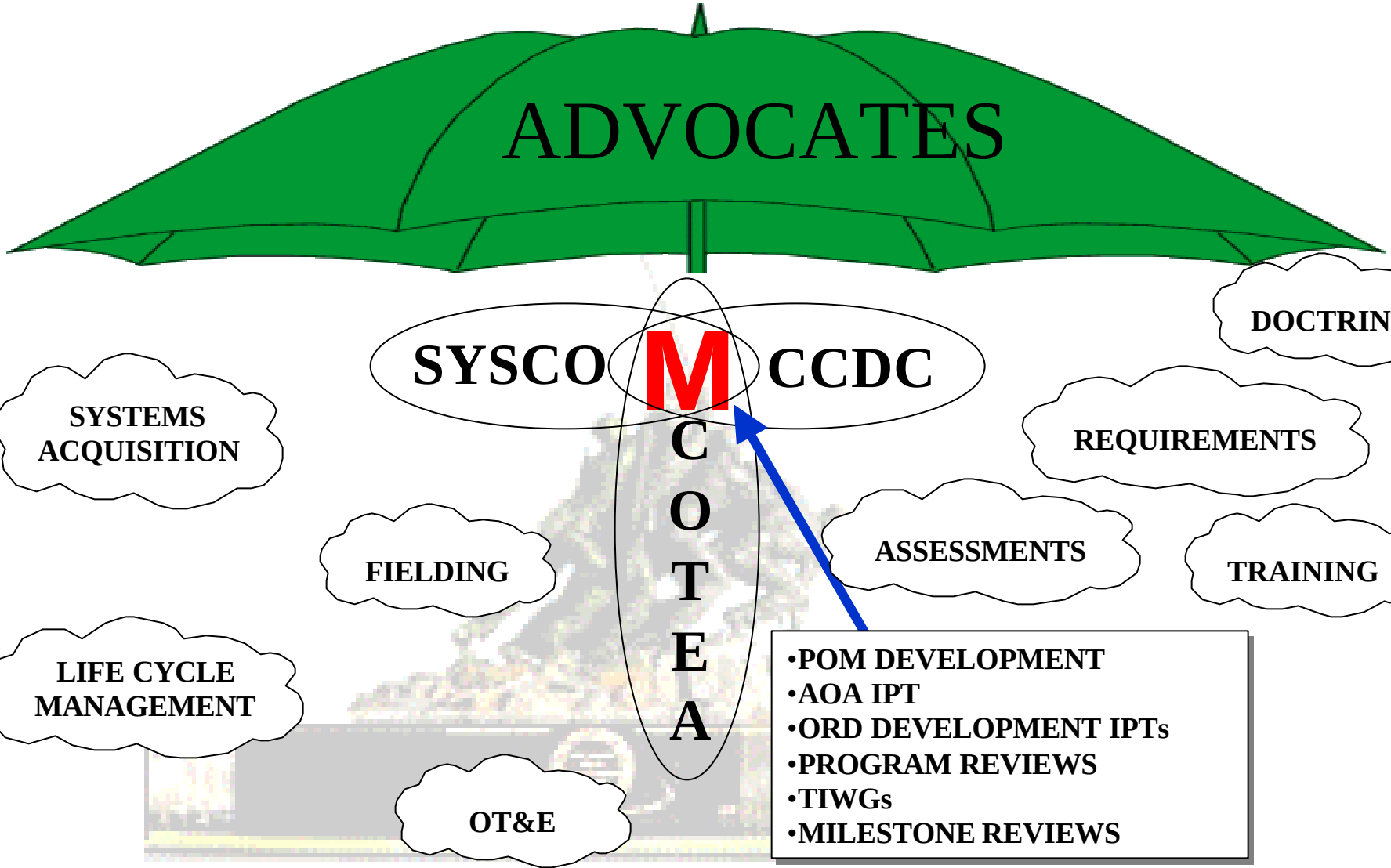
BACKGROUND

Scope of Programs at MARCORSYSCOM

	ACAT (including the IT variants)					
	I (all variants)	II	III	IV-T	IV-M	AAP
Joint	15	3	39	5	4	0
Single Service	0	3	24	52	67	87
Total	15	6	63	57	71	87

BACKGROUND

THE MARINE CORPS ACQUISITION TEAM



BACKGROUND

MDA Concerns

Programs tended to be underfunded

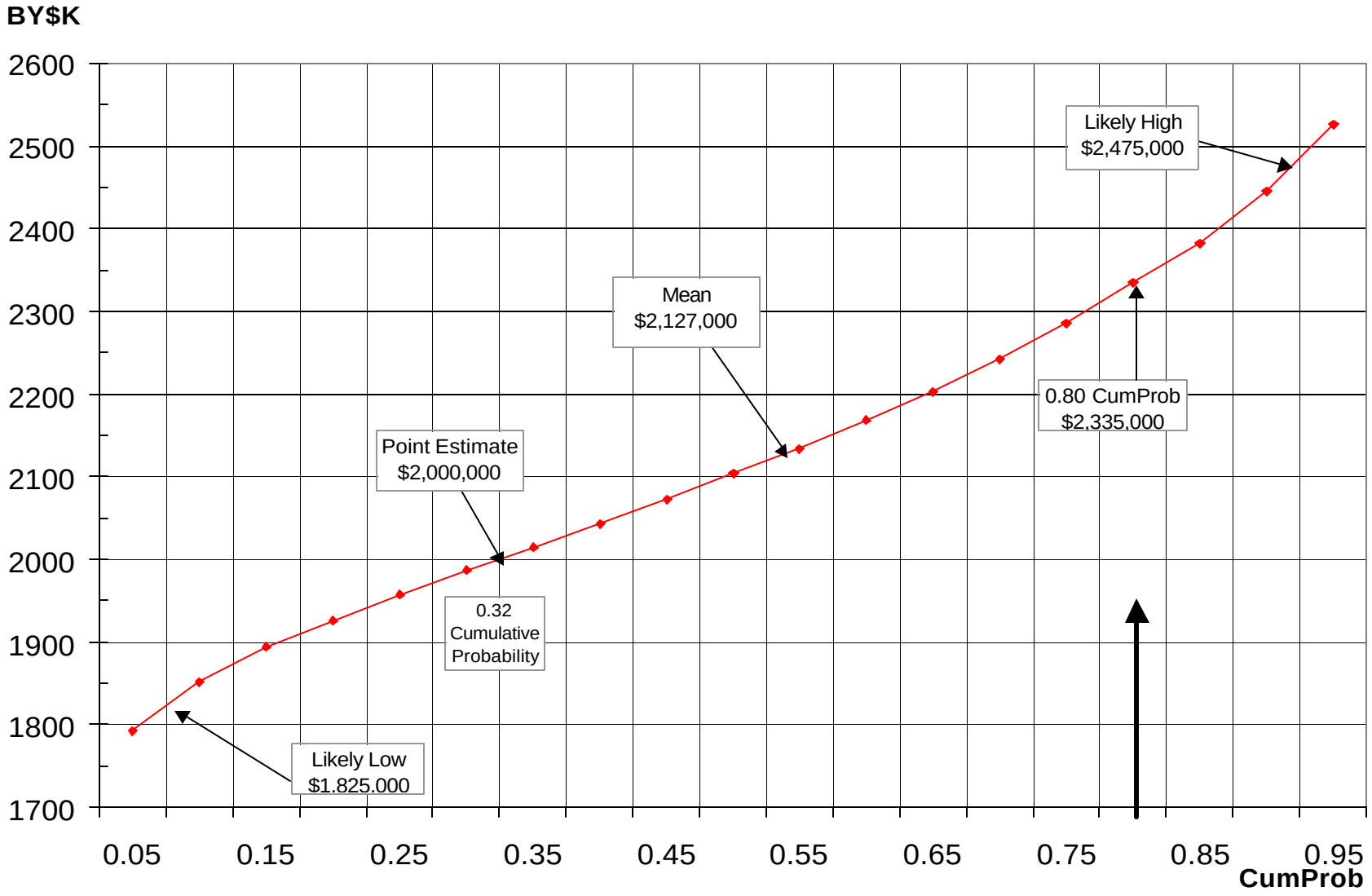
Past Continuous Improvement Efforts

Shifted from “point estimates” to “range estimates”

Were proposing a shift from the original Point Estimate to a risk-adjusted estimate set at the 0.5 Cumulative Probability level

BACKGROUND

Generic Cumulative Probability Curve



BACKGROUND

POM-04 provided a timely opportunity to implement the decision to ensure that programs are funded at the 0.8 CumProb level.

Methodology Overview

Decide which initiatives should have the process applied.

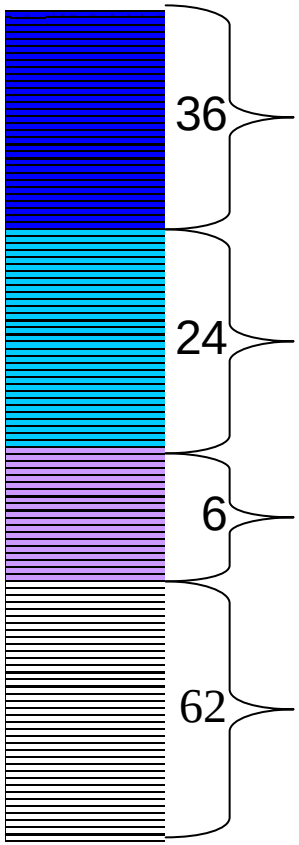
Apply the process in priority order.

Assess the results.

Apply lessons learned and prepare for the next POM cycle.

Methodology (Application)

Categorization of POM 04 Initiatives and the timeline applied:



128 Total

36 — Phase I
8 Nov – 11 DEC

Developmental, high dollar value; interview required.
(3 were supported by standard LCCEs, so no interview was done.)

24 — Phase II
12 Dec – 11 Jan

Developmental, medium dollar value; interview required

6 — Phase III
11 – 18 Jan

Special interest; apply default values, no interview required.

62 — Deferred

Modifications, Product Improvement Programs (PIPs), low tech & COTS/NDI items, buyouts, those of a Level of Effort (LOE) or sustainment nature, roll-ups and limited scope initiatives; deferred.

Methodology (Process)

Establish default risk factor values based on the nature of the cost element and program maturity

Conducted an interview with each PMO

Assessed each PIB input value in terms of its Likely Low and Likely High (treating each as a 10-90 truncated triangular density function)

Aggregated through a Monte Carlo 10K iteration simulation for each appropriation

Prepared cumulative probability distribution function graphs and other briefing backup materials for the record

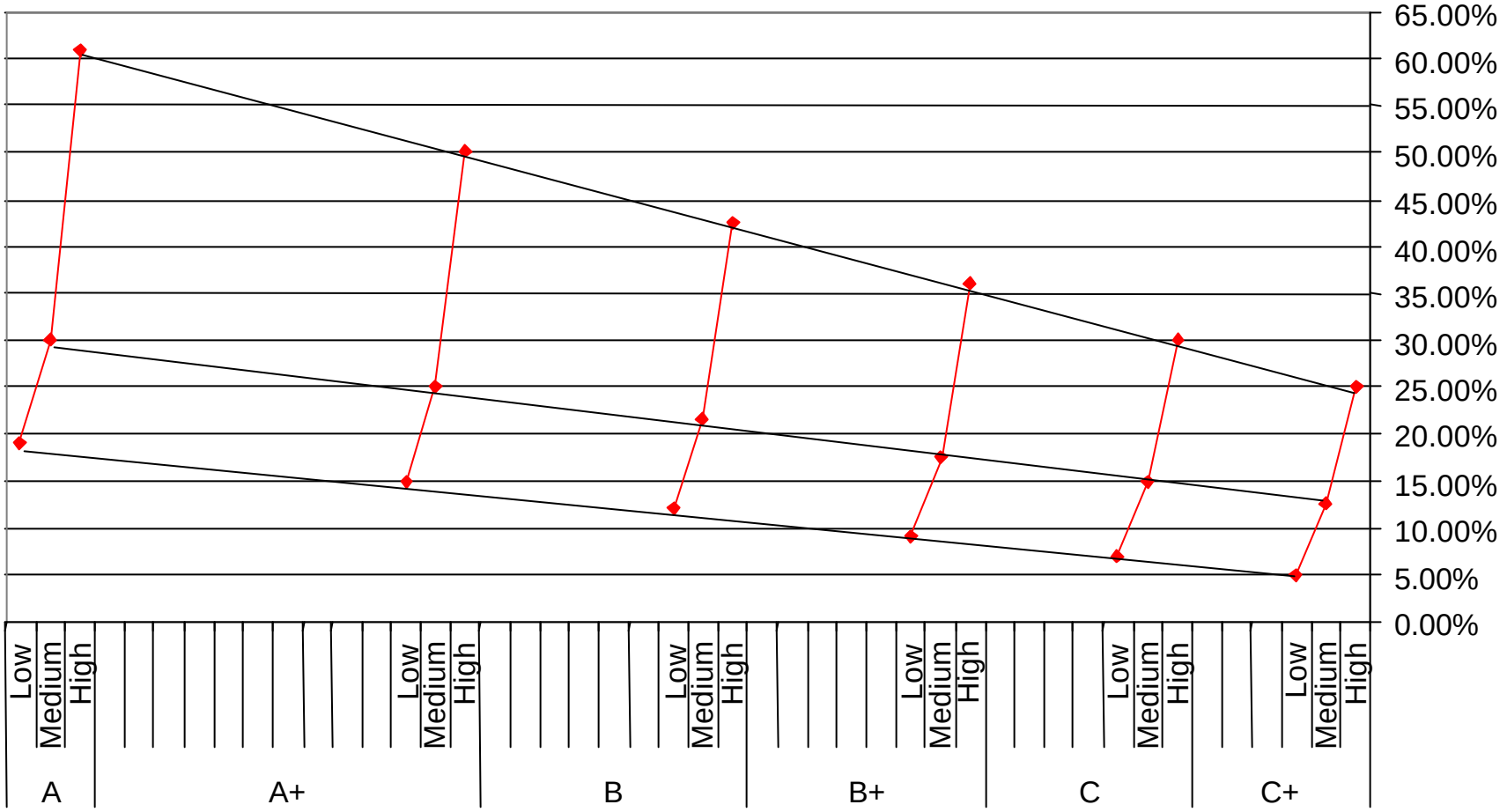
Prepared the slide for insertion into their brief

Provided instruction in how to implement the risk adjustment

RISK STANDARDS

Confidence versus Risk Factor as related to program maturity

(default uncertainty range; applied with 1.5x left skew if COTS/GOTS/etc. or 1.5x right skew if full-up developmental, and applied with 2.0x right skew if highly S/W-dependent, etc.)



Milestones and risk (uncertainty) assessment

POINT ESTIMATE TO RANGE ESTIMATE CONVERSION

	Point Estimate	Likely Low $	Likely Low %	Point Estimate $	Point Estimate %	Likely High $
A. Research, Development, Test & Evaluation (RDT&E)	**$ 9,130**	**$ 7,948**	**-13%**	**$ 9,130**	**21%**	**$ 11,084**
PRIME CONTRACTOR EXPENSES						
Concept & Tech Dev	$ -	$ -	-30.0%	$ -	60.0%	$ -
System Dev & Demo	$ 4,000	$ 3,600	-10.0%	$ 4,000	20.0%	$ 4,800
Post Milestone C	$ 1,000	$ 950	-5.0%	$ 1,000	5.0%	$ 1,050
GOVERNMENT EXPENSES						
In-House Program Mgt	$ 2,250	$ 1,800	-20.0%	$ 2,250	40.0%	$ 3,150
Contractor Advise & Assist Serv	$ -	$ -	-15.0%	$ -	30.0%	$ -
Travel / TAD	$ 80	$ 68	-15.0%	$ 80	30.0%	$ 104
Operational T&E Costs	$ 1,800	$ 1,530	-15.0%	$ 1,800	10.0%	$ 1,980
Post Milestone III/C	$ -	$ -	-5.0%	$ -	5.0%	$ -

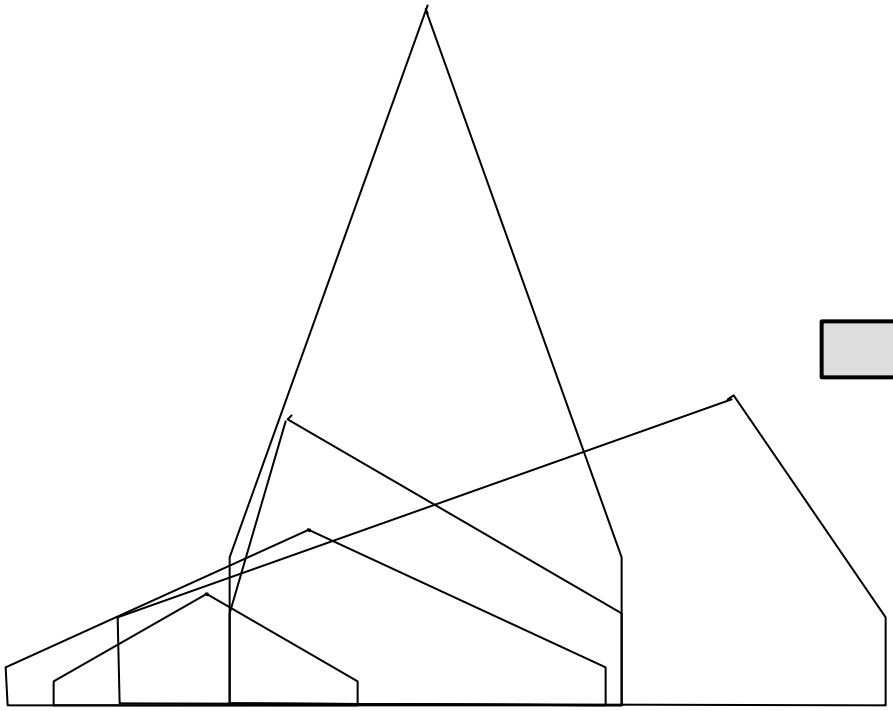
POINT ESTIMATE TO RANGE ESTIMATE CONVERSION

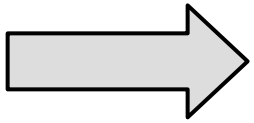
	Point Estimate	Likely Low $	Likely Low %	Point Estimate $	Point Estimate %	Likely High $
B. Procurement, Marine Corps (PMC)	**$ 257,135**	**$ 246,730**	**-4%**	**$ 257,135**	**10%**	**$ 284,004**
End Item Subtotal ($000)	$ 224,928	$ 219,305	-2.5%	$ 224,928	10.0%	$ 247,421
First-Article Test	$ -	$ -	-20.0%	$ -	5.0%	$ -
Test Article (s)	$ -	$ -	-20.0%	$ -	40.0%	$ -
Contractor Consulting Services	$ 4,127	$ 3,508	-15.0%	$ 4,127	30.0%	$ 5,365
Modification Kits	$ -	$ -	-20.0%	$ -	40.0%	$ -
Installation of MOD Kits	$ -	$ -	-20.0%	$ -	40.0%	$ -
Gen Purpose Tools, Sets, & Kits	$ -	$ -	-5.0%	$ -	5.0%	$ -
General Purpose Test Equip	$ -	$ -	-5.0%	$ -	5.0%	$ -
Special Purpose Test Equip	$ -	$ -	-10.0%	$ -	20.0%	$ -
Gen Purpose Training Devices	$ -	$ -	-10.0%	$ -	15.0%	$ -
Spec Purpose Training Devices	$ -	$ -	-15.0%	$ -	30.0%	$ -
Support Vehicles/Equip	$ -	$ -	-10.0%	$ -	10.0%	$ -
Integrated Logistics Support	$ 1,030	$ 824	-20.0%	$ 1,030	40.0%	$ 1,442
First Destination Transportation	$ 1,212	$ 1,151	-5.0%	$ 1,212	10.0%	$ 1,333
Factory Training	$ -	$ -	-10.0%	$ -	15.0%	$ -
Travel	$ 412	$ 330	-20.0%	$ 412	15.0%	$ 474
Initial Spares	$ -	$ -	-10.0%	$ -	20.0%	$ -
Other (Specify)	$ 25,426	$ 21,612	-15.0%	$ 25,426	10.0%	$ 27,969
C. Procurement, Ammunition (PANMC)	**$ -**	**$ -**	**#DIV/0!**	**$ -**	**#DIV/0!**	**$ -**
Ammo	$ -	$ -	-10.0%	$ -	20.0%	$ -

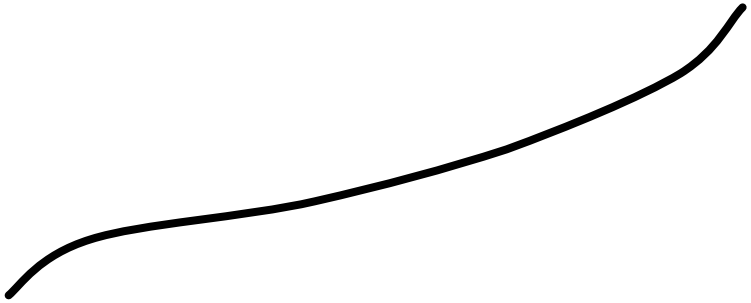
POINT ESTIMATE TO RANGE ESTIMATE CONVERSION

	Point Estimate	Likely Low $	Likely Low %	Point Estimate $	Point Estimate %	Likely High $
D. Operations & Maintenance Marine	$ 8,837	$ 7,543	-15%	$ 8,837	29%	$ 11,425
Second Destination Trans (SDT)	$ -	$ -	-20.0%	$ -	40.0%	$ -
Travel	$ 630	$ 567	-10.0%	$ 630	20.0%	$ 756
Acquisition Support						
Management & Professional Service Support (CAAS)	$ -	$ -	-15.0%	$ -	30.0%	$ -
Contractor Engineer & Technical Services (CAAS)	$ 5,042	$ 4,286	-15.0%	$ 5,042	30.0%	$ 6,555
PM Support (Non-CAAS)	$ 3,165	$ 2,690	-15.0%	$ 3,165	30.0%	$ 4,115
Contractor Log Support (CLS)						
Albany	$ -	$ -	-15.0%	$ -	30.0%	$ -
Non-Albany	$ -	$ -	-20.0%	$ -	40.0%	$ -
O&M New Equipment	$ -	$ -	-30.0%	$ -	60.0%	$ -
Depot Maintenance	$ -	$ -	-20.0%	$ -	40.0%	$ -
Post-Deploy Software Spt (PDSS)						
MCTSSA	$ -	$ -	-30.0%	$ -	60.0%	$ -
Non-MCTSSA	$ -	$ -	-30.0%	$ -	60.0%	$ -
Training Support						
Formal Schools Support (AG/SAG 3B4D)	$ -	$ -	-15.0%	$ -	30.0%	$ -
Lifecycle Support (AG/SAG 3B4D)	$ -	$ -	-15.0%	$ -	30.0%	$ -
Other (Specify)	$ -	$ -	-30.0%	$ -	60.0%	$ -
E. Operations & Maintenance,	$ -	$ -	#DIV/0!	$ -	#DIV/0!	$ -
Acquisition Support						
Management & Professional Service Support (CAAS)	$ -	$ -	-15.0%	$ -	30.0%	$ -
Contractor Engineer & Technical Services (CAAS)	$ -	$ -	-15.0%	$ -	30.0%	$ -
PM Support (Non-CAAS)	$ -	$ -	-15.0%	$ -	30.0%	$ -
O&M New Equipment (Reserves)	$ -	$ -	-8.0%	$ -	30.0%	$ -
Depot Maintenance	$ -	$ -	-20.0%	$ -	40.0%	$ -
Post-Deploy Software Spt (PDSS)						
MCTSSA	$ -	$ -	-30.0%	$ -	60.0%	$ -
Non-MCTSSA	$ -	$ -	-30.0%	$ -	60.0%	$ -
Manpower (MPMC)	$ -	$ -	-10.0%	$ -	10.0%	$ -
Reserve Manpower (RPMC)	$ -	$ -	-10.0%	$ -	10.0%	$ -
Military Construction (MCON)	$ -	$ -	-20.0%	$ -	40.0%	$ -
Military Const Reserves (MCNR)	$ -	$ -	-20.0%	$ -	40.0%	$ -

Methodology (Process - Monte Carlo simulation)

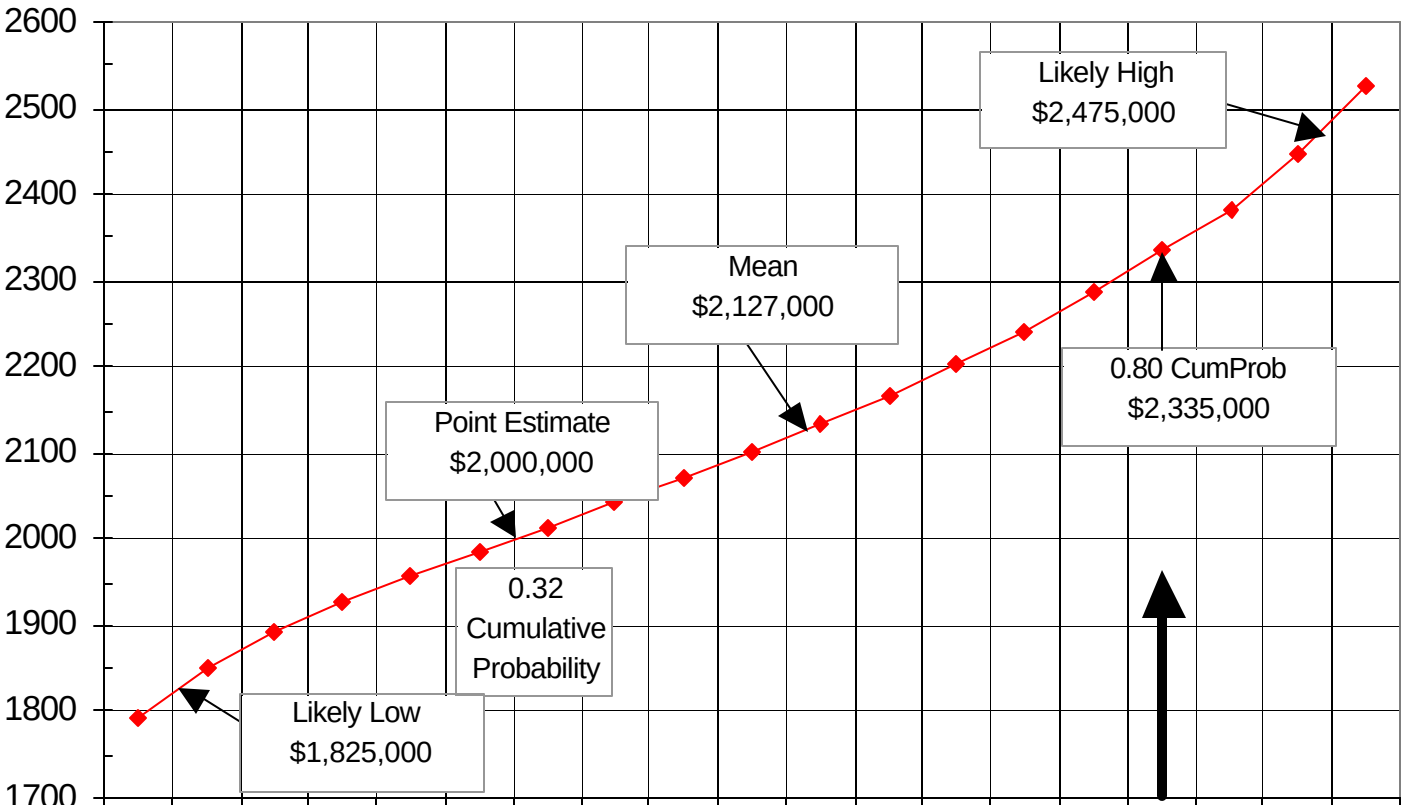






Methodology (Process - CumProb chart)

Cumulative Probability Plot of the POM-04 RDT&EN Costs for the AAV-R7



	0.05	0.1	0.15	0.2	0.25	0.3	0.35	0.4	0.45	0.5	0.55	0.6	0.65	0.7	0.75	0.8	0.85	0.9	0.95
CumProbRDT&EN (TY$K)	1793	1852	1895	1927	1958	1987	2014	2043	2072	2104	2134	2168	2203	2242	2285	2335	2383	2445	2526

Methodology (Process - Briefing charts)

Sample Products

80% Cumulative Probability Funding Level

AAV-R7

CumProb		FYDP Total (TY$K)
Total Initiative		
0.30	**Initiative Estimate**	**$92,473**
0.80	Risk-Adjusted PIB	**$111,843**
	Spread of Risk Funds	**$19,370**

	Low	Middle	Risk-Adjusted	High
Adj % ->	-9%	7%	21%	28%
CumProb ->	0.10	0.50	0.80	0.90
Total ->	**$84,422**	**$99,000**	**$111,843**	**$118,469**
difference ->	($8,051)	$6,527	$19,370	$25,996

80% Cumulative Probability Funding Level by Appropriation

AAV-R7

CumProb		FYDP Total (TY$K)					
RDT&EN							
0.32	Initiative Estimate	**$2,000**	Adj % ->	-7%	5%	17%	22%
				Low	Middle	Risk-Adjusted	High
			CumProb ->	0.10	0.50	0.80	0.90
0.80	Risk-Adjusted PIB	**$2,335**	**Total** ->	**$1,852**	**$2,104**	**$2,335**	**$2,445**
	Spread of Risk Funds	**$335**	difference ->	($148)	$104	$335	$445
PMC							
0.30	Initiative Estimate	**$88,473**	Adj % ->	-9%	7%	21%	28%
				Low	Middle	Risk-Adjusted	High
			CumProb ->	0.10	0.50	0.80	0.90
0.80	Risk-Adjusted PIB	**$107,072**	**Total** ->	**$80,869**	**$94,788**	**$107,072**	**$113,426**
	Spread of Risk Funds	**$18,599**	difference ->	($7,604)	$6,315	$18,599	$24,953
O&MMC							
0.37	Initiative Estimate	**$2,000**	Adj % ->	-15%	5%	22%	30%
				Low	Middle	Risk-Adjusted	High
			CumProb ->	0.10	0.50	0.80	0.90
0.80	Risk-Adjusted PIB	**$2,436**	**Total** ->	**$1,701**	**$2,108**	**$2,436**	**$2,598**
	Spread of Risk Funds	**$436**	difference ->	($299)	$108	$436	$598
Total Initiative							
0.30	**Initiative Estimate**	**$92,473**	Adj % ->	-9%	7%	21%	28%
				Low	Middle	Risk-Adjusted	High
			CumProb ->	0.10	0.50	0.80	0.90
0.80	Risk-Adjusted PIB	**$111,843**	**Total** ->	**$84,422**	**$99,000**	**$111,843**	**$118,469**
	Spread of Risk Funds	**$19,370**	difference ->	($8,051)	$6,527	$19,370	$25,996

Methodology (Process - Implementation)

Instructions to the PM:

“The Risk Adjustment should be applied among the cost elements within each appropriation and across the FYDP period in a manner that most appropriately mitigates and manages the risks.”

Results Summary

(TY$K)	Point Estimate (Most Likely)	CumProb of PtEst (Most Likely)	Additional % to get to 0.8 CumProb	Additional $ to get to 0.8 CumProb	Risk-Adjusted (0.8 CumProb) Estimate
Min	$ 8,953	0.12	2.0%	$ 1,391	$ 10,557
Average	$ 132,671	0.33	12.6%	$ 13,234	$ 145,905
Max	$ 643,555	0.61	28.0%	$ 83,877	$ 655,841
Total	$ 8,225,598			$ 820,517	$ 9,046,115

For 62 POM-04 Initiatives

INTENTIONS

Improve and enhance the procedure for the POM-06 cycle.

Continue development of policy and procedures for application of 0.8 CumProb to LCCEs (including setting of the APBA Section C Objective value)

Asses best practices from amongst the cost analysis and POM/FM communities.

Summary of Key Points

The interview by a cost analyst provided a critical review of the entire Initiative in a supportive environment.

This process was embryonic, but refinement continues.

The funds added to an Initiatives plan based on cost uncertainty was not a clever way to create a management reserve.

QUESTIONS/CONCERNS/ISSUES

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BACKUPS

Topic

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